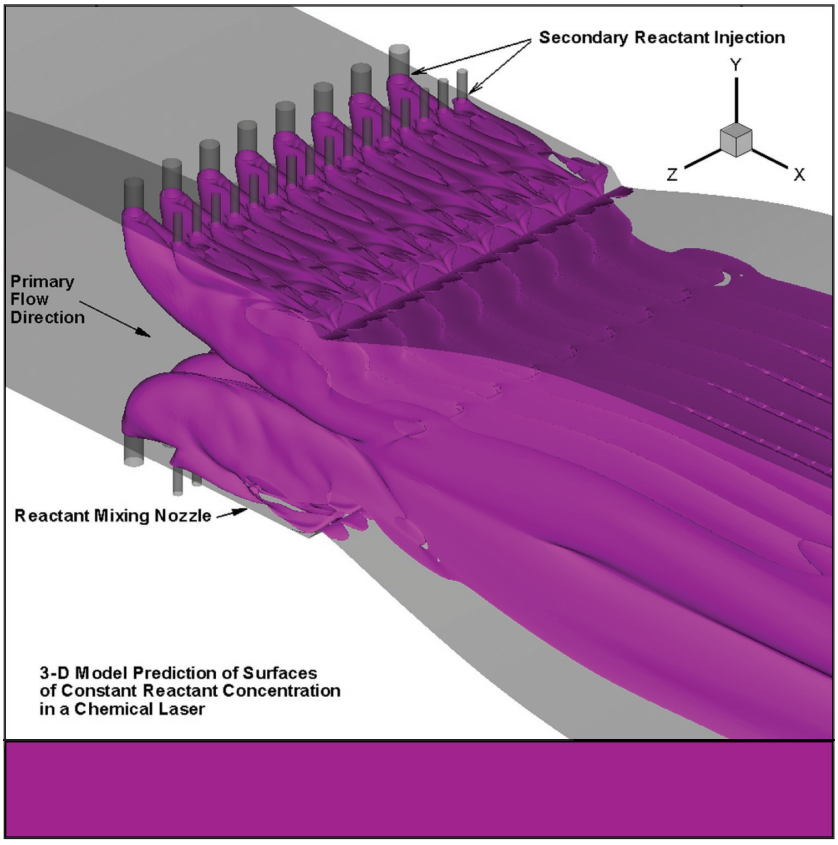
Air Force Research Laboratory|AFRL

Science and Technology for Tomorrow's Air and Space Force

Success Story

DIRECTED ENERGY DIRECTORATE DEMONSTRATES A POWERFUL NEW METHOD FOR CHEMICAL LASER SIMULATION



Directed Energy Directorate engineers demonstrated a new and powerful method for simulating high-power chemical lasers. Testing of chemical laser simulation models using the commercial software package GASP, from AeroSoft, Inc., demonstrates a 350% improvement in computing capability over previously used software.

Air Force Research Laboratory
Wright-Patterson AFB OH

Accomplishment

The directorate's High Power Gas Lasers Branch demonstrated significant improvements in the modeling and simulation of high-power chemical lasers. Directorate engineers, using Air Force Office of Scientific Research funding, modified the commercial software package GASP, from AeroSoft, Inc., to include physical models pertinent to chemical laser simulation and incorporated the software into current chemical laser research activities. Directorate engineers demonstrated a 350% improvement in computer capability over previous software during testing of chemical laser simulation models utilizing GASP on Department of Defense High Performance Computing Modernization program supercomputers.

Background

The directorate performs three-dimensional (3-D) simulations of chemical lasers including the chemical oxygen-iodine laser, the hydrogen-fluoride/deuterium-fluoride laser, and the recently demonstrated all gas phase iodine laser. These simulations explore the intricacies and complexities of chemical lasers by directly modeling the complex couplings between fluid dynamics, mixing and reaction of chemical fuels, and the extraction of photons during lasing.

The detail of these simulations generates information about these lasers that is difficult, if not impossible, to generate in experiments. This detail comes with a large cost in computer resources, and improvements in computational efficiency and capability serve to enable these simulations.

Through the careful application of these simulations, directorate engineers will identify pathways to higher chemical efficiencies and higher powers for testing in chemical laser systems. Such improvements translate into smaller and lighter chemical lasers, enabling the placement of these lasers into warfighter platforms such as the Airborne Laser and the Tactical High Energy Laser Fighter.

Directed Energy
Emerging Technologies

Additional information

To receive more information about this or other activities in the Air Force Research Laboratory, contact TECH CONNECT, AFRL/XPTC, (800) 203-6451 and you will be directed to the appropriate laboratory expert. (02-DE-03)